

ENDURO Classic · Classic Plus · Premium

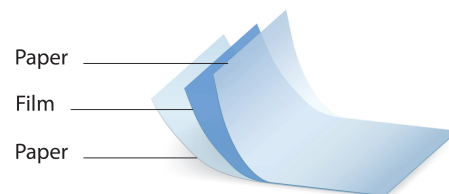
Recommendations for printing and processing

ENDURO products are durable and hardwearing: this is made possible by a special compound construction of film core sandwiched between two layers of paper. Thus ENDURO combines the best properties of film and paper: allowing processing like a paper, which can be printed or written on, at the same time being tear resistant, impermeable to water and offering excellent wet-strength.

Thanks to the multi-layer product structure ENDURO offers an affordable, eco-friendly and sustainable alternative to fully synthetic media. All grades are FSC®- certified and PVC-free.

The ENDURO standard product range is classified in accordance with the quality of the paper surface:

- **ENDURO Classic** – classical optics and haptics due to a surface made of natural paper
- **ENDURO Classic Plus** – increased surface smoothness due to calendered offset paper
- **ENDURO Premium** – best printing results on matt and glossy coated paper grades



Depending on the specification, the film core consists of a biaxially oriented polyester or polypropylene film (PET or PP) thus giving the composite material stability and strength.

General information on printing

Both paper surfaces and film core have an influence on print quality, running characteristics and conversion.

All ENDURO Classic, Classic Plus, and Premium surfaces types can be printed without restriction in conventional printing processes (offset printing, flexo printing, screen printing). You can find an overview showing which types are suitable for the different printing technologies in our table in the Appendix "Suitability of Printing Technologies".

Prior to processing ENDURO we recommend basic testing in advance - through all production processes and by way of live application tests.

OFFSET PRINTING (web/sheet offset)

ENDURO can be printed sheet and web offset with both conventional inks and oxidatively drying or UV/LED-reactive inks. The drying process may take longer owing to the non-absorbent film core and increased net weight of the composite material. Additives that retard drying (roller freshness retainers) should be avoided. An optimised ink-water balance with low water flow is generally recommended.

For the smooth paper surfaces (ENDURO Classic Plus + Premium), a corresponding coating, powder application, under-colour reduction and lower stack heights help to avoid any ink off-setting.

When sheet printing the matt-coated ENDURO Premium grades with oxidising inks, stack height should again be reduced while ensuring adequate separation of the sheets by fanning out, in order to avoid potential ghosting.

If templates are created in offset printing for subsequent printing on laser/LED printers, we recommend using heat-resistant inks free of mineral oil and dispensing with printing powder spraying.

Practical tip: A single-sided printing of ENDURO with high coverage of ink, water or varnish can result in increased curl of the printed sheets towards the printed image. The reason for this is the barrier function of the film core, which favours a one-sided elongation during moisture absorption and subsequent shrinkage during drying. We therefore recommend moistening the reverse in order to ensure a balanced, even drying process for both sides.

FLEXO PRINTING

Suitable for printing with UV-reactive and water-based flexographic inks.

Practical tip: If templates are created in flexo printing for subsequent printing on laser/LED printers, we recommend using UV-reactive flexographic printing inks, as a partial impairment of the toner transfer can occur with water-based inks.

DRY TONER-BASED PRINTING SYSTEMS (laser/LED printers)

Owing to the large number of toner-based printing systems across different performance classes, a general recommendation for processing is not possible. In general, the printing systems can be divided into two categories:

- **Office printers, multifunction printers, desktop laser/LED printers**
Only a limited selection of pre-set media options/types is available for these models. As a rule of thumb, copier papers can be processed with a maximum grammage of 220 g/m². Neither the fixing temperature nor the toner transfer voltage can be adjusted manually. In the case of ENDURO grades from 160 g/m² and over, it is necessary to check in advance whether the material corresponds to the device specifications. Test either the media type with the highest grammage or the setting for film (overhead transparency) in the printer settings.
- **Industrial printers, production machines, professional colour laser printers, web-fed laser printers**
With these professional printing systems, a higher grammage is basically possible and own media profiles can be created or, in some cases, downloaded from the media database. The toner transfer voltage and fixing temperature can also be adapted to suit the material, which can be helpful for ENDURO types in heavier weights.

As high paper moisture impairs the voltage flow in laser printing, always make sure that unprinted papers are well packed and protected against a high ambient moisture. We produce some grades, those regularly called upon by our customers for laser printing, with a reduced paper moisture content in order to improve toner transfer (types: 6901, 6903, 6912, 6921, 6925, 6948, 6958, 6960, 6977, 6989).

The combination of paper and film may result in curl during or directly after laser printing. Owing to the high fixing temperatures of 130 to 200°C (depending on the type of printer), the paper loses moisture and shrinks, while the film core does not react. The resultant curl often disappears after some time through ambient moisture. We therefore recommend leaving the print stack for 24 hours in an air-conditioned environment.

In a dry room climate, an increased static charge can result between the sheets after laser printing. Experience has shown that this charge dissipates after some time, whereby fanning out the sheets assists the process. We therefore recommend leaving the printed stack for several hours in an air-conditioned environment (ideal room climate @ 20 ± 5°C and 50 ± 10 % rel. humidity)

LIQUID TONER-BASED PRINTING SYSTEMS (HP Indigo)

6958 (ENDURO Premium 280 matt) has HP Indigo-certified paper surfaces. The two grades 6901 (ENDURO Classic 90 L) and 6903 (ENDURO Classic 100 L) have also proven suitable for printing with HP Indigo sheet-fed printing systems.

For all other types, we recommend an appropriate primer is applied to the paper surface beforehand, or to carry out tests with the HP Indigo ElectroInk Primer.

INKJET PRINTING

In general, the ENDURO Classic types are printable with water-based inkjet printing with dye or pigment ink, though for improved print quality, faster ink drying, higher colour brilliance and edge sharpness we recommend our special ENDURO inkjet range with surface-treated &/or coated inkjet papers.

UV inkjet printing - good printing results are possible across all ENDURO grades.

For inkjet printing with latex inks, experience has shown ENDURO Classic Plus and Premium types from 200 g/m² to be effective due to the device-specific heat drying. We do not provide printer profiles for this and recommend that you carry out your own print trials.

ENDURO is not suitable for inkjet printing with solvent inks.

THERMAL TRANSFER PRINTING (flat-head/near-edge printers)

Smooth paper surfaces mean that ENDURO Classic Plus and Premium grades are generally suitable for printing on thermal transfer printers with wax or wax/resin ribbons.

Owing to the large number of printer manufacturers and printer models with print heads in different resolutions (200/300/600 dpi) and various quality levels of ink ribbons, we recommend extensive testing in advance with the relevant components.

Practical tip: For the higher grammages with high material stiffness, we recommend using near-edge printers

General information on processing

ENDURO can be processed like paper: cutting, punching, perforating, drilling, folding, stapling, gluing, stamping etc. However, the material composition means a few points have to be observed during processing:

CUTTING

The tear resistance is only retained if the cut edge is neat and smooth. Knives and cutting tools should be sharpened and maintained so that the cutting edges do not squeeze and fray. Such irregularities lead to defined breaking points that tear easily. Separating cuts behind the knife should be provided with a neat counter-cut.

FOLDING

The film core means that ENDURO achieves a high fold strength and tear resistance and has slightly higher reset forces than paper.

The running direction of the paper needs to be considered, ideally with folding parallel to the running direction. At grammages above 160 g/m², we recommend scoring the fold.

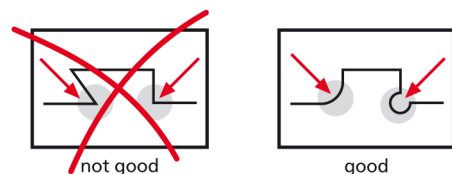
SCORING

As the film core cannot be compressed, it must be ensured that the scoring tools do not have any sharp edges and that the paper surfaces are not squeezed. As a rule, scoring should be done with a slightly wider and deeper scoring groove appropriate to the respective sheet thickness. Types with PET film core have higher reset forces and must be provided with a wider scoring groove. It may be necessary to check whether a fold with an outside scoring groove leads to better results.

Practical tip: Our experience with ENDURO has revealed that scoring transverse to the running direction can paradoxically lead to less fold breaking. ENDURO Premium grades are more suitable for scoring than ENDURO Classic, Classic Plus grades. We always recommend corresponding scoring tests before printing.

PUNCHING

All corners should be rounded during punching, as sharp corners or notches mean a predetermined breaking point where the material may tear easily. Carbide punching knives are recommended (e.g. made from alloyed chrome or high-frequency welded steel).

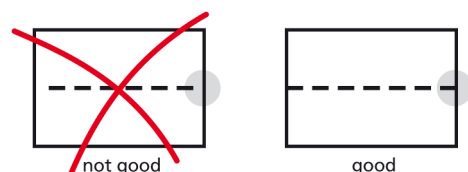


STAMPING

ENDURO is ideal for hot-foil stamping. For relief embossing, we recommend carrying out tests in advance as the material composition is only deformable to a certain extent.

PERFORATING

As ENDURO has increased tear strength, the first cut must always begin at the edge of the sheet.



GLUING

For gluing the paper surfaces when manufacturing envelopes or folders, all dispersion and hot-melt adhesives are appropriate. Prolonged drying times are to be expected owing to the barrier function of the film core. For adhesive bindings for book or writing pad production, we recommend corresponding tests and consultation with the glue supplier.

DRILLING

It is essential to control the drilling stroke speed and drill speed during drilling. The drill must not overheat and should be well lubricated, for instance by pulse lubrication with wax paper. To prevent the drill from overheating and hence melting of the material, it is necessary to work with low stack heights, high stroke speed and a low drill speed. Teflon-coated drills are recommended and should be sharpened regularly by professionals.

STORAGE

Storage should be in the original packaging, if possible. Please re-pack overs/remaining sheets so they are airtight again.

The ideal room climate for converting and storage is $20 \pm 5^{\circ}\text{C}$ and $50 \pm 10\%$ relative humidity. Store the sheets unopened for least 24 hours after delivery for acclimatisation in the printer room and do not open the packaging until shortly before printing. In a very dry room climate, the sheets tend to curl. We therefore recommend that you do not unpack the sheets until shortly before printing.

DISPOSAL & RECYCLING

You can find detailed information on this in our relevant safety instructions, which our Customer Service will be pleased to send you. By email at: CustomerService.Dueren@sihl.com

ENDURO

Suitability of printing technologies

Quality	g/m ²	µm	Surface papers	Film core	Thermal transfer printing	Dot Matrix printer	Inkjet waterbased inks dye/pigment	Inkjet with UV-inks	Office & Multifunction Printer Dry Toner · Laser · LED	Production Print Press Dry Toner · Laser · LED	HP Indigo	Conventional offset / litho printing	UV-offset / litho printing	Flexo printing [UV & waterbased]
6901	ENDURO Classic 90 L	95	100	uncoated	PP 28 µm	T	✓	T	✓	✓	✓	✓	✓	✓
6903	ENDURO Classic 100 L	100	115	uncoated	PP 40 µm	T	✓	T	✓	✓	✓	✓	✓	✓
6946	ENDURO Classic 145 K	145	160	uncoated	PET 23 µm	T	✓	T	✓	✓	P	✓	✓	✓
6921	ENDURO Classic 150 K	145	175	uncoated	PP 40 µm	T	✓	T	✓	✓	P	✓	✓	✓
6948	ENDURO Classic 175 K	180	185	uncoated	PET 50 µm	T	✓	T	✓	Δ	✓	P	✓	✓
6950	ENDURO Classic 255 K	255	235	uncoated	PET 100 µm	T	✓	T	✓	Δ	✓	P	✓	✓
6970	ENDURO Classic 345 A	345	345	uncoated	PET 100 µm	T	✓	T	✓	Δ	✓	P	✓	✓
6977	ENDURO Classic Plus 190 G	185	170	calendered	PP 40 µm	✓	o	o	✓	✓	✓	P	✓	✓
6925	ENDURO Classic Plus 200 J	205	215	calendered	PP 40 µm	✓	o	o	✓	Δ	✓	P	✓	✓
6978	ENDURO Classic Plus 225 G	220	185	calendered	PET 50 µm	✓	o	o	✓	Δ	✓	P	✓	✓
6979	ENDURO Classic Plus 285 G	290	240	calendered	PET 100 µm	✓	o	o	✓	Δ	✓	P	✓	✓
6900	ENDURO Premium 150 matt	150	140	matt-coated	PP 40 µm	✓	o	o	✓	✓	✓	P	✓	✓
6989	ENDURO Premium 155 matt	160	135	matt-coated	PET 36 µm	✓	o	o	✓	✓	✓	P	✓	✓
6703	ENDURO Premium 210 gloss	205	175	gloss-coated	PP 40 µm	✓	o	o	✓	Δ	✓	P	✓	✓
6958	ENDURO Premium 280 matt	280	230	matt-coated	PP 40 µm	✓	o	o	✓	Δ	✓	✓	✓	✓
6981	ENDURO Effect 100 Water improved	105	100	impregnated	PP 28 µm	o	o	o	✓	✓	✓	o	✓	✓
6670	ENDURO Effect 120 Opaque white	125	150	uncoated	PP + AL 35 µm	T	✓	T	✓	o	T	P	✓	✓
6688	ENDURO Effect 130 Opaque silver	130	150	uncoated	PP + AL 30 µm	T	✓	T	✓	o	T	P	✓	✓
6912	ENDURO Effect 140 Water improved	145	190	impregnated	PP 28 µm	o	o	o	✓	✓	✓	o	✓	✓
6821	ENDURO Effect 155 RFID shield	155	145	uncoated	PET + AL 32 µm	T	✓	T	✓	o	T	P	✓	✓
6918	ENDURO Effect 245 Metal detectable	240	235	uncoated	PET + AL 59 µm	T	✓	T	✓	o	T	P	✓	✓
6908	ENDURO Effect 285 Heat resistant	290	240	gloss coated	PET 75 µm	✓	o	o	✓	Δ	✓	P	✓	✓
6902	ENDURO Extra 120 K	125	145	uncoated	PP 40 µm	T	✓	T	✓	✓	✓	P	✓	✓
6938	ENDURO Ice 80	80	100	uncoated	PP 50 µm	T	T	o	✓	✓	✓	P	✓*	✓
6962	ENDURO Ice 90 sustainable	85	100	uncoated	PLA 40 µm	T	T	o	✓	o	o	P	✓*	✓
6952	ENDURO Ice 135	140	130	uncoated	PET 75 µm	T	T	o	✓	✓	✓	P	✓*	✓
6995	ENDURO Inkjet 110 Classic 2s	110	130	surface treated	PP 28 µm	T	✓	✓	✓	✓	✓	P	✓	✓

o not suitable / Δ check printer specifications / T to be tested in advance / ✓ proven · suitable / ✓* suitable with inks drying by oxidation
 ✓✓ HP Indigo certified surface paper / P Tests with prior primer application or HP ElectroInk Primer required

The values stated above are only for orientation. Before using our print media please check its compatibility for your printing system and the intended application. Please consider our recommendation for printing and processing.

ENDURO

Product properties and resistances

Quality	g/m ²	µm	Surface papers	Film core	Opacity	Stiffness	Initial tear resistance	Durability	Foldability	Fold strength / rating	Abrasion resistance wet	Outdoor resistance	Recyclable	Food contact
6901	ENDURO Classic 90 L	95	100	uncoated	PP 28 µm	++	+	+	+	+++	++	+	+	✓ ² (-)
6903	ENDURO Classic 100 L	100	115	uncoated	PP 40 µm	++	+	+	+	+++	++	+	+	✓ ² (-)
6946	ENDURO Classic 145 K	145	160	uncoated	PET 23 µm	++	++	+	+	++	++	+	+	✓ ² ✓ ³
6921	ENDURO Classic 150 K	145	175	uncoated	PP 40 µm	++	++	+	+	++	++	+	+	✓ ² ✓ ³
6948	ENDURO Classic 175 K	180	185	uncoated	PET 50 µm	++	++	++	++	+ ¹	++	+	++	✓ ² ✓ ³
6950	ENDURO Classic 255 K	255	235	uncoated	PET 100 µm	++	+++	+++	+++	+ ¹	++	+	++	✓ ² ✓ ³
6970	ENDURO Classic 345 A	345	345	uncoated	PET 100 µm	+++	+++	+++	+++	+ ¹	++	+	++	✓ ² ✓ ³
6977	ENDURO Classic Plus 190 G	185	170	calendered	PP 40 µm	++	++	+	+	+ ¹	++	+	+	✓ ² ✓ ³
6925	ENDURO Classic Plus 200 J	205	215	calendered	PP 40 µm	++	++	+	+	+ ¹	++	+	+	✓ ² ✓ ³
6978	ENDURO Classic Plus 225 G	220	185	calendered	PET 50 µm	++	++	++	++	+ ¹	++	+	++	✓ ² ✓ ³
6979	ENDURO Classic Plus 285 G	290	240	calendered	PET 100 µm	++	+++	+++	+++	+ ¹	++	+	++	✓ ² ✓ ³
6900	ENDURO Premium 150 matt	150	140	matt-coated	PP 40 µm	++	++	+	+	++	++	+	+	✓ ² ✓ ³
6989	ENDURO Premium 155 matt	160	135	matt-coated	PET 36 µm	++	++	++	++	++ ¹	++	+	+	✓ ² ✓ ³
6703	ENDURO Premium 210 gloss	205	175	gloss-coated	PP 40 µm	++	++	+	+	++ ¹	++	+	+	✓ ² ✓ ³
6958	ENDURO Premium 280 matt	280	230	matt-coated	PP 40 µm	+++	+++	+	+	++ ¹	++	+	+	✓ ² (-)
6981	ENDURO Effect 100 Water improved	105	100	impregnated	PP 28 µm	+	+	+	+	+++	++	++	+++	✓ ² (-)
6670	ENDURO Effect 120 Opaque white	125	150	uncoated	PP + AL 35 µm	+++	++	+	+	++	++	+	+	✓ ² ✓ ³
6688	ENDURO Effect 130 Opaque silver	130	150	uncoated	PP + AL 30 µm	+++	+	+	+	++	++	+	+	— ✓ ³
6912	ENDURO Effect 140 Water improved	145	190	impregnated	PP 28 µm	+	++	++	+	++	++	+++	+++	— (-)
6821	ENDURO Effect 155 RFID shield	155	145	uncoated	PET + AL 32 µm	+++	++	+	+	++	++	+	+	✓ ² ✓ ³
6918	ENDURO Effect 245 Metal detectable	240	235	uncoated	PET + AL 59 µm	+++	+++	++	++	+ ¹	++	+	++	✓ ² ✓ ³
6908	ENDURO Effect 285 Heat resistant	290	240	gloss coated	PET 75 µm	+++	+++	++	++	+ ¹	++	+	+	✓ ² (-)
6902	ENDURO Extra 120 K	125	145	uncoated	PP 40 µm	++	+	+	+	++	++	+	+	✓ ² (-)
6938	ENDURO Ice 80	80	100	uncoated	PP 50 µm	—	+	++	+	+++	++	+	+	— ✓ ³
6962	ENDURO Ice 90 sustainable	85	100	uncoated	PLA 40 µm	—	+	+	+	++	++	+	+	— ✓ ³
6952	ENDURO Ice 135	140	130	uncoated	PET 75 µm	—	++	++	++	++ ¹	++	+	++	— ✓ ³
6995	ENDURO Inkjet 110 Classic 2s	110	130	surface treated	PP 28 µm	++	+	+	+	++	++	+	+	✓ ² (-)

+ standard, good / ++ high, better / +++ very high, very good
 ✓ applicable / — not applicable / (-) not tested
 +¹ Creasing before folding recommended

✓² Paper fibers recoverable through standard paper-recycling, more details you can find in our Media Safety Information
 ✓³ For application with food-contact please inform us in advance. We check suitability and provide you with a Declaration of Compliance

The values stated above are only for orientation. Before using our print media please check its compatibility for your printing system and the intended application. Please consider our recommendation for printing and processing.